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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/629,459	07/29/2003	Guogen Zhang	SVL920030024US1	7326

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GATES & COOPER LLP
HOWARD HUGHES CENTER
6701 CENTER DRIVE WEST, SUITE 1050
LOS ANGELES, CA 90045

EXAMINER	
ADAMS, CHARLES D	

ART UNIT	PAPER NUMBER
2164	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/629,459	ZHANG ET AL.	
	Examiner	Art Unit	
	CHARLES D. ADAMS	2164	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 April 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Remarks

1. In response to communications filed on 28 April 2008, claims 4-6 are amended. Claims 1-9 are pending in the application.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cheng et al. ("Implementation of Two Semantic Query Optimization Techniques in DB2 Universal Database"), in view of Cochrane et al. (US Patent 5,963,936), and further in view of Al-omari et al. (US Patent 6,438,741).

As to claim 1, Cheng et al. teaches a method of optimizing a query in a computer system, the query being performed by the computer system to retrieve data from a database stored on the computer system (see Abstract), the method comprising:

(a) during compilation of the query, maintaining a GROUP BY clause (see Cheng et al. Page 1, Example 1, and Page 5, query 1)

Cheng et al. does not teach with one or more GROUPING SETS, ROLLUP or CUBE operations

Cocharane et al. teaches with one or more GROUPING SETS, ROLLUP or CUBE operations (see column 7, lines 26-30, and column 7, lines 44-48)

Cheng et al. as modified teaches in its original form, instead of rewriting the GROUP BY clause, until after query rewrite (see Cheng et al. Page 1, Example 1, and Page 5, query 1. In Q'1, the group by clause has been retained); and

(b) at a later stage of query compilation, translating the GROUP BY clause with the GROUPING SETS, ROLLUP, or CUBE operations into a plurality of levels, wherein each of the levels has one or more grouping sets (see Cochrane et al. 8:26-42, Figure 7. This step occurs after the step listed above) comprised of grouping columns (see 11:62-12:15. The GROUP BY sets are comprised of columns a, b, x, and y),

Cheng et al. as modified does not teach generating a query execution plan for the query with a super group block having an array of grouping sets, wherein each pointer points to the grouping sets for a particular one of the levels.

Al-omari et al. teaches generating a query execution plan for the query with a super group block having an array of grouping sets, wherein each pointer points to the grouping sets for a particular one of the levels (see Figure 3D, 'link mode to GROUP'. Also see 10:36-48, 14:28-35, 41-43)

Cheng et al. as modified teaches:

(c) performing the query execution plan to retrieve data from a database stored on the computer system (see Cochrane et al. 7:41-43).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Cheng et al. by the teachings of Cochrane et al., since Cochrane et al. teaches that “a method for detecting and stacking grouping sets to support group by operations with grouping sets, rollup, and cube extensions in relational database management systems, with greatly reduced numbers of grouping sets” (see Abstract).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have further modified Cheng et al. by the teachings of Al-omari et al., since Al-omari et al. teaches "a system and method for optimizing complex SQL database queries" (see 3:18-19).

As to claim 2, Cheng et al. as modified teaches further comprising:

(1) at query execution time, dynamically determining a grouping sequence for the GROUP BY clause with the GROUPING SETS, ROLLUP or CUBE operations based on intermediate grouping sets, in order to optimize the grouping sets sequence (see Cochrane et al. 8:26-42, Figure 7).

As to claim 3, Cheng et al. as modified teaches wherein the dynamically determining step further comprises (1) performing a GROUP BY for a base grouping set and then optimizing execution of the grouping sets sequence by selecting a grouping set having lowest cardinality from a previous one of the levels as an input to a grouping set on a next one of the levels (see Cochrane et al. 11:43-47. The GROUP BYs “are

stacked from greatest to least cardinality". There is only one grouping set per level. It is inherent, then, that the chosen grouping set sequence from a previous one of the levels will be the smallest one on its level), and (2) performing a UNION ALL operation on the grouping sets (see Cochrane et al. 11:47-49 and Figure 7. "The base group by and all the GROUP BYs for ROLLUP1 are unioned together. If all of the GROUP BYs are unioned together, then it is functionally equivalent to a UNION ALL").

As to claim 4, Cheng et al. teaches a computer-implemented apparatus for optimizing a query, the query being performed to retrieve data from a database, the apparatus comprising:

(a) a computer system;

(b) means, performed by the computer system, for

(1) during compilation of the query, maintaining a GROUP BY clause (see Cheng et al. Page 1, Example 1, and Page 5, query 1)

Cheng et al. does not teach with one or more GROUPING SETS, ROLLUP or CUBE operations

Cochrane et al. teaches with one or more GROUPING SETS, ROLLUP or CUBE operations (see column 7, lines 26-30, and column 7, lines 44-48)

Cheng et al. as modified teaches in its original form, instead of rewriting the GROUP BY clause, until after query rewrite (see Cheng et al. Page 1, Example 1, and Page 5, query 1. In Q'1, the group by clause has been retained); and

(2) at a later stage of query compilation, translating the GROUP BY clause with the GROUPING SETS, ROLLUP, or CUBE operations into a plurality of levels, wherein each of the levels has one or more grouping sets (see Cochrane et al. 8:26-42, Figure 7. This step occurs after the step listed above) comprised of grouping columns (see Cochrane et al. 11:62-12:15. The GROUP BY sets are comprised of columns a, b, x, and y),

Cheng et al. as modified does not teach generating a query execution plan for the query with a super group block having an array of pointers, wherein each pointer points to the grouping sets for a particular one of the levels.

Al-omari et al. teaches generating a query execution plan for the query with a super group block having an array of pointers, wherein each pointer points to the grouping sets for a particular one of the levels (see Figure 3D, 'link mode to GROUP'. Also see 10:36-48, 14:28-35, 41-43)

Cheng et al. as modified teaches:

(3) performing the query execution plan to retrieve data from a database stored on the computer system (see Cochrane et al. 7:41-43).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Cheng et al. by the teachings of Cochrane et al., since Cochrane et al. teaches that "a method for detecting and stacking grouping sets to support group by operations with grouping sets, rollup, and cube extensions in relational database management systems, with greatly reduced numbers of grouping sets" (see Abstract).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have further modified Cheng et al. by the teachings of Al-omari et al., since Al-omari et al. teaches "a system and method for optimizing complex SQL database queries" (see 3:18-19).

As to claim 5, see the argument in regards to claim 2 above.

As to claim 6, see the argument in regards to claim 3 above.

As to claim 7, Cheng et al. teaches an article of manufacture comprising a program storage device embodying instructions that, when read and executed by a computer system, cause the computer system to perform a method for optimizing a query, the query being performed by the computer system to retrieve data from a database stored in a data storage device coupled to the computer system (see Abstract), the method comprising:

(a) during compilation of the query, maintaining a GROUP BY clause

Cheng et al. does not teach with one or more GROUPING SETS, ROLLUP or CUBE operations

Cochrane et al. teaches with one or more GROUPING SETS, ROLLUP or CUBE operations (see column 7, lines 26-30, and column 7, lines 44-48)

Cheng et al. as modified teaches:

in its original form, instead of rewriting the GROUP BY clause, until after the query rewrite (see Cheng et al. Page 1, Example 1, and Page 5, query 1. In Q'1, the group by clause has been retained); and

(b) at a later stage of query compilation, translating the GROUP BY clause with the GROUPING SETS, ROLLUP or CUBE operations into a plurality of levels, wherein each of the levels has one or more grouping sets (see 8:26-42, Figure 7. This step occurs after the step listed above) comprised of grouping columns (see 11:62-12:15. The GROUP BY sets are comprised of columns a, b, x, and y)

Cheng et al. as modified does not teach generating a query execution plan for the query with a super group block having an array of pointers, wherein each pointer points to the grouping sets for a particular one of the level

Al-omari et al. teaches generating a query execution plan for the query with a super group block having an array of pointers, wherein each pointer points to the grouping sets for a particular one of the level (see Figure 3D, 'link mode to GROUP'. Also see 10:36-48, 14:28-35, 41-43)

Cheng et al. as modified teaches:

(c) performing the query execution plan to retrieve data from a database stored on the computer system (see Cochrane et al. 7:41-43).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Cheng et al. by the teachings of Cochrane et al., since Cochrane et al. teaches that "a method for detecting and stacking grouping sets to support group by operations with grouping sets, rollup, and cube

extensions in relational database management systems, with greatly reduced numbers of grouping sets" (see Abstract).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have further modified Cheng et al. by the teachings of Al-omari et al., since Al-omari et al. teaches "a system and method for optimizing complex SQL database queries" (see 3:18-19).

As to claim 8, see the rejection in regards to claim 2 above.

As to claim 9, see the rejection in regards to claim 3 above.

Response to Arguments

4. Applicant's arguments filed 28 April 2008 have been fully considered but they are not persuasive.

Applicant argues, in regards to the independent claims, that "Cheng merely shows the GROUP BY clause in the same form in both the original query and the optimized query, indicating that the GROUP BY clause is not 'maintained during compilation' and then ;translated at a later stage of query compilation,' as recited in Applicants' claims. Instead, the GROUP BY clause of Cheng is apparently left untouched during the join elimination optimization". In response to this argument, it is noted that Cheng et al. maintains the GROUP BY clause between Q1 and Q1'. Thus,

the GROUP BY clause is being maintained and not rewritten until the query rewrite goes through this optimization phase of Cheng et al. It is noted that the query is rewritten by the combination of Cheng et al. and Cochrane et al., at a later stage of query compilation (see rejection above).

Applicant argues that "this optimization scheme of Cochrane says nothing about maintaining a GROUP BY clause with one or more GROUPING SETS, ROLLUP or CUBE operations in its original form, instead of rewriting the GROUP BY clause, until after query rewrite". It is noted that the combination of Cheng et al. and Cochrane et al. is used to teach this feature. Cheng et al. teaches a method of optimizing the joins of a query, and Cochrane et al. teaches a method of optimizing the grouping sets of a query into a query graph model.

Applicant argues that "however, the groups from Al-omari are in no way equivalent to Applicants' claimed super group block. Specifically, the memo structure of Al-omari includes one or more groups, where each group contains an array of pointers to one or more logical expressions, an array of pointers to one or more physical expressions, an array of pointers to one or more contexts, an array of pointers to one or more plans, and an exploration pass indicator. In Applicants' claims, on the other hand, the super group block supports the translation of a GROUP BY clause with the GROUPING SETS, ROLLUP, or CUBE operations into the plurality of levels, wherein each of the levels has one or more grouping sets comprised of grouping columns, the

super group block has an array of pointers, and each pointer of the super group block points to the grouping sets for a particular one of a plurality of levels. This super group block of Applicants' recites different structure and functions as compared to the memo structure of Al-omari". Examiner notes that Cochrane et al. is relied upon to teach "the translation of a GROUP BY clause with the GROUPING SETS, ROLLUP, or CUBE operations into the plurality of levels, wherein each of the levels has one or more grouping sets comprised of grouping columns". It is also noted that the memo data structure of Al-omari et al. teaches "a search data structure used by the optimizer for representing elements of the search space. The Memo data structure is organized into equivalence classes denoted as groups. Each group includes one or more logical and physical expressions that are semantically equivalent to one another. Expressions are semantically equivalent if they produce the identical output. Initially each logical expression of the input query tree is represented as a separate group in memo". Cochrane et al. teaches multiple expressions in a query, and Al-omari et al. teaches to organize expressions into a data structure with an array of pointers, each pointer pointing to expressions for different levels. Thus, the claimed elements are taught by Cheng et al. in view of Cochrane et al., in view of Al-omari et al.

Conclusion

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CHARLES D. ADAMS whose telephone number is (571)272-3938. The examiner can normally be reached on 8:30 AM - 5:00 PM, M - F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Charles Rones can be reached on (571) 272-4085. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/C. D. A./
Examiner, Art Unit 2164

/Charles Rones/
Supervisory Patent Examiner, Art Unit 2164